

REMARKS/ARGUMENTS

Reconsideration of this application is requested. Claims 17-20 and 22- 32 are in the case.

I. THE PRIOR ART REJECTIONS

Claims 17, 18, 20, 22-24, and 29-31 stand rejected under 35 U.S.C. §102(b) as allegedly anticipated by Nowlin *et al.* (U.S. 5,332,706) (Nowlin). Claim 31 stand rejected under 35 U.S.C. §102(b) as allegedly anticipated by or, in the alternative, under 35 U.S.C. §103(a) as allegedly obvious over Nowlin. Claims 17-20, 22-24, and 29-32 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Brinen *et al.* (U.S. 5,721,184) (Brinen) in view of extrinsic evidence furnished by Speca *et al.* (U.S. 5,786,291) (Speca). Claim 25 stands rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Brinen in view of Canich *et al.* (U.S. 5,075,475) (Canich). Claims 25 and 27 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Brinen in view of Stevens *et al.* (U.S. 5,064,802) (Stevens). Claims 26-28 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Brinen in view of Jacobsen *et al.* (U.S. 5,834,393) (Jacobsen). The rejections are respectfully traversed.

The invention as claimed provides a process for the polymerisation of olefin monomers selected from (a) ethylene, (b) propylene (c) mixtures of ethylene and propylene and (d) mixtures of (a), (b) or (c) with one or more other alpha-olefins. The process comprises performing the polymerization in a polymerisation reactor in the presence of a supported polymerisation catalyst wherein, prior to injection into the reactor, the supported polymerisation catalyst in the form of a powder is contacted with

an inert hydrocarbon liquid in the absence of any other catalyst components in a quantity sufficient to maintain said catalyst in powder form, and wherein the inert hydrocarbon liquid is present in amount up to about 10% of the pore volume of the support.

Claims 17 and 31 specify that the contact of the supported polymerisation catalyst in powder form with the inert hydrocarbon is performed in the absence of any other catalyst components. Support for this amendment appears in the specification and working examples of the present application, for example at page 14, lines 23-25. No new matter is entered.

The effect of the inert hydrocarbon liquid being present in an amount up to about 10% of the pore volume of the support is that the supported polymerization catalyst is essentially slightly wetted with a small amount of the inert hydrocarbon liquid prior to injection into the reactor. With this post-contact of the catalyst with the inert hydrocarbon liquid, it has been found, surprisingly, according to the present invention, that a reduction in the level of fines associated with the final polymer resins is observed.

Referring to the anticipation rejection of claims 17, 18, 20, 22 - 24 and 29 - 31 over Nowlin, the Action asserts that the addition of 5 ml aliquots of a metallocene/MAO solution in toluene equates with the addition of an inert hydrocarbon liquid in amount up to about 10% of the pore volume of the support as required by claim 17. This assertion is respectfully traversed.

At the outset, it is assumed that the Action is referring to Example 3 of Nowlin. In this example, the final polymerization catalyst is prepared in two stages. In the first

stage, a supported Ziegler-Natta catalyst is prepared based on dibutylmagnesium and titanium tetrachloride. Nowlin states (column 13, line 21) that:

"The product of the first stage has an estimated pore volume of 1.5 cc/g (738 cc of pore volume)".

This product of the first stage is then treated with catalyst components in the form of a mixture of a metallocene and methyl aluminoxane (MAO) solution in toluene. As Nowlin notes (column 13, line 27):

"The total volume of the methyl aluminoxane/toluene solution is equal to or less than the total pore volume of the first step".

Claim 17, on the other hand, requires that, prior to injection into the reactor, the powdered supported polymerisation catalyst is contacted with the inert hydrocarbon liquid in the **absence** of any other catalyst components, and in a quantity sufficient to maintain the catalyst in powder form, and wherein the inert hydrocarbon liquid is present in amount up to about 10% of the pore volume of the support. In the presently claimed invention, it is thus the **final** supported catalyst that is treated (or slightly wetted) with an inert hydrocarbon liquid. As seen in Example 1 on page 14 of the present specification, the supported catalyst comprising the metallocene/activator is dried to give a free flowing powder which is then treated with hexane as the inert hydrocarbon liquid (see, page 14, lines 23-25).

This is clearly different from Nowlin. Nowlin provides no disclosure of the treatment of a supported polymerization catalyst with an inert hydrocarbon liquid as required by present claim 17. In Example 3 of Nowlin, the second stage of the preparation of the supported catalyst involves treatment of the product from the first

stage (supported titanium/magnesium Ziegler catalyst) with a mixture of a metallocene and a toluene solution of methyl aluminoxane in several aliquots over a period of 90 mins. At the end of this procedure, a final supported multisite catalyst is obtained which is then used for polymerization.

In summary, two differences between the present invention and the disclosure of Nowlin are apparent. First, in the present invention, it is the final supported catalyst which is treated with an inert hydrocarbon liquid. Secondly, the supported catalyst is treated with the inert hydrocarbon liquid in the absence of any other catalyst components. In contrast, in Nowlin, toluene is added as part of a mixture of metallocene and aluminoxane as activator and is still part of the preparation of the final catalyst, rather than a post-treatment, as in the presently claimed invention.

Nowlin clear does not anticipate the invention as claimed. Withdrawal of the anticipation rejection over Nowlin is respectfully requested.

Referring to the prior art rejection of claim 31 over Nowlin, claim 31 claims a method for the reduction of fines associated with a polymer product obtained by the polymerisation of olefin monomers selected from (a) ethylene, (b) propylene (c) mixtures of ethylene and propylene and (d) mixtures of (a), (b) or (c) with one or more other alpha-olefins performed in a polymerisation reactor in the presence of a supported polymerisation catalyst, wherein the supported polymerization catalyst, in powder form, is contacted, prior to injection into the reactor, with an inert hydrocarbon liquid in the absence of any other catalyst components in a quantity sufficient to maintain the catalyst in powder form, and wherein the inert hydrocarbon liquid is present in amount up to about 10% of the pore volume of the support. Claim 31, as amended, therefore

requires use of the same supported catalyst as amended claim 17, and is not anticipated by Nowlin for the same reasons that claim 17 is not anticipated by Nowlin. Withdrawal of the anticipation rejection of claim 31 over Nowlin is respectfully requested.

Referring to the obviousness rejection of claims 17-20, 22-24 and 29-32 over Brinen in view of the extrinsic evidence of SpecA, Brinen relates to the preparation of a supported catalyst system wherein a small volume of catalyst component is evenly distributed on a porous support material. The level of fines is reportedly reduced in Brinen, but this is achieved in a different way to the present invention.

Brinen (col. 5, lines 44-58) describes the volume of the catalyst solution used in relation to the pore volume of the support. Brinen discloses that the total volume of the catalyst solution which is applied at one time to the support is most preferably less than 1.5 times the pore volume of the support. Further, Brinen (col. 5, line 53) discloses that the ratio of catalyst solution to pore volume is more preferably about 1.3:1 to about 1.7:1. However, Brinen is referring here to the amount of catalyst solution used in the preparation of the supported polymerization catalyst, and not to an additional contact with a small amount of solvent prior to injection into the reactor, as required in the presently claimed invention.

Example 3 of Brinen, referred to in the Action, describes a supported polymerization catalyst being further treated with an antistatic agent in toluene. The Action determines the amount of toluene added to the support based on the silica having a total pore volume of 34,020 cm³ and a volume of toluene added of 184 cm³ thus corresponding to 0.54% of the total pore volume of the catalyst. However, the

Examiner's calculations are based on the disclosure "a solution of 160 grams of AS990 (the antistatic compound) in toluene solution as added". Moreover, as there is no indication as to the quantity of toluene used, the Examiner's calculation is based on the weight of the antistatic compound and not on the volume of toluene and, thus, is **incorrect**.

In Example 3, there is already a large amount of toluene (44 lbs ~ 33157g) present from the catalyst preparation. Therefore, at the time the solution of the antistatic in toluene is added, the supported catalyst is not in powder form, as required by the present claims.

On page 4 of the Action, reference is made to the type of solvent used, and then the Action asserts that:

"...it would have been obvious to add to the supported catalyst a solution of antistatic and hexane and since hexane is merely the carrier solvent and it would have been expected the catalyst to work in reducing fines with a reasonable expectation of success". (Emphasis added)

This position is respectfully traversed. In Brinen, the reduction in fines observed is due to either (or both) the presence of the antistatic agent or the even distribution of a small volume of catalyst component on the porous support material. The hexane used in the present invention is not simply as "...the carrier solvent" but is the reason for the unexpected reduction in fines.

In the present invention, there is no addition of an antistatic agent but merely the slight wetting of the supported catalyst prior to injection into the reactor. The Action (page 4) asserts that:

"While the working example (of Brinen) does not show addition of antistatic agent to dried, supported catalyst, it would have been obvious..... "

However, even if the toluene, used in Brinen as solvent for the addition of the antistatic agent to the supported catalyst, is considered to equate to the "inert hydrocarbon liquid" of the present invention (which it does not), there is no indication in Brinen as to the amount of toluene used with respect to the pore volume of the support.

The Action (page 3) notes that Brinen (col. 6, lines 5-9) discloses that the antistatic compound may be added while the catalyst system is in "the free flowing state". As there is no antistatic compound required in the present invention, this feature of Brinen is irrelevant to the presently claimed invention.

Brinen provides no suggestion of the use of a supported catalyst without the presence of an antistatic agent, and no suggestion of the contact of a supported polymerization catalyst in powder form with an inert hydrocarbon liquid in the absence of any other catalyst components and in a quantity sufficient to maintain the catalyst in powder form, and wherein the inert hydrocarbon liquid is present in amount up to about 10% of the pore volume of the support, as required by the present claims.

In addition, as recognized in the Action, in Example 3 of Brinen, the solution of the antistatic compound in toluene is added to a **solution** of a mixture of the metallocene, methyl aluminoxane and the support. This is different to the present invention where the inert liquid hydrocarbon is added to the supported catalyst in **powder** form.

On this point, the Action asserts that it would have been obvious for the expert to add the antistatic compound to a free flowing powder since this possibility is also disclosed in Brinen (at col. 6, line 9). However, as there is no antistatic compound required in the present invention, this feature of Brinen is irrelevant to the presently claimed invention.

Specia does not furnish extrinsic evidence to in any way cure the above-discussed deficiencies of Brinen. Specia describes drying of a supported polymerization catalyst (see, column 9, lines 1-50). The supported catalyst system is contacted with a volume of hydrocarbon liquid, e.g., an aliphatic hydrocarbon (column 9, lines 29-41), and volume of hydrocarbon liquid is preferably equal to or less than that required to form a slurry, and most preferably between 0.7 and 0.95 times the total pore volume of the support (column 9, lines 34-41). Therefore, while Specia discloses treatment of a supported catalyst system with an inert hydrocarbon liquid, the treatment is carried out using a much higher amount of liquid with respect to the pore volume of the support. In fact, at a volume about equal to the pore volume, a slurry would be formed and, even at the lower limit of 0.7 times the pore volume, the supported catalyst would be almost in a slurry medium.

In the presently claimed invention, the amount of inert hydrocarbon liquid is present in an amount of up to about 10% of the pore volume of the support, which is a much **lower** amount than disclosed in Specia. In the present invention, no slurry medium is used. Rather, the supported catalyst is contacted with a minimal amount of the hydrocarbon liquid to maintain the catalyst in powder form.

In light of the above, it is clear that one of ordinary skill would not have resorted to the combined disclosures of Brinen and Specia and, in any event, the claimed invention is not rendered obvious by those disclosures, taken alone or in combination. Withdrawal of the obviousness rejection over Brinen in view of Specia is believed to be in order. Such action is respectfully requested.

Regarding the obviousness rejection of claim 25 over Brinen in view of Canich, the obviousness rejection of claims 25 and 27 over Brinen and Stevens, and the obviousness rejection of claims 26-28 over Brinen and Jacobsen, as Brinen is irrelevant for the reasons discussed above, and since the secondary art fails to cure the deficiencies of Brinen, it is clear that all these obviousness rejections should be withdrawn. Such action is respectfully requested.

Favorable action is awaited.

Respectfully submitted,

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